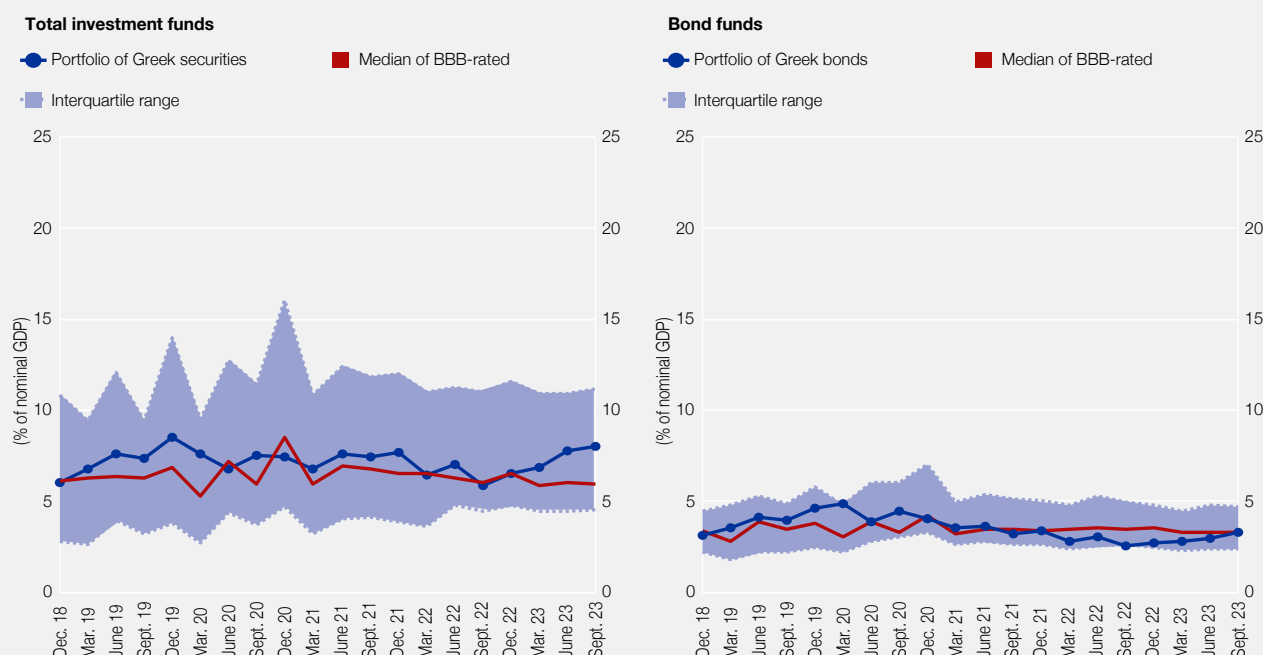


Chart C Evolution of positions in Greek securities and BBB-rated securities



Sources: Lipper for Investment Management, IMF (World Economic Outlook) and Bank of Greece calculations.

Note: The chart shows the evolution of the value of investment fund portfolio positions in Greek securities and BBB-rated securities. The left panel includes stocks and bonds, while the right panel only includes bonds. Specifically, the chart depicts investment positions in the Greek market (blue line), as well as the distribution over time of investment positions in countries with a BBB credit rating weighted by the nominal GDP of each country (the red line depicts the median and the shaded area the interquartile range 75%-25%).

Conclusions

Investment funds, like all other types of non-bank financial intermediaries, have an increasingly important role as a source of finance globally. Around 80% of the European funds' and 88% of the US funds' holdings are in investment grade securities. In recent years, and in particular since the fourth quarter of 2021, there has been a shift in their holdings internationally towards higher-rated securities. This observation relates to the tightening of monetary conditions worldwide, leading to a reduction in the exposure of funds to riskier assets.

At the same time, however, investment funds' purchases of Greek bonds and equities increased by EUR 2.1 billion and EUR 3.5 billion, respectively, already in the fourth quarter of 2022, i.e. ex ante to the upgrade of Greece's sovereign credit rating to investment grade. This increase appears to explain the significant decline in Greek sovereign bond spreads and the increase in equity prices for the period up to the third quarter of 2023. In other words, international investment funds seem to have anticipated the upgrade of Greece's sovereign credit rating to investment grade, as during the same period they reduced their exposure to non-investment grade securities. Finally, it is also noteworthy that the increase in the exposure of investment funds benefited significantly the private sector of the Greek economy, as shown by the strong rise in investment funds' holdings of Greek equities.

Box 19

STOCKTAKE TOWARDS THE ACHIEVEMENT OF THE PARIS AGREEMENT GOALS

The Paris Agreement (hereinafter the "Agreement"), reached in December 2015 in the context of the 21st UN Climate Change Conference (COP21), sets as a key goal to hold the increase in the global average temperature

to well below 2°C above pre-industrial levels, while trying to limit the temperature increase even further to 1.5°C by 2050.

The 195 countries that have signed the Agreement commit, inter alia, to periodically review their overall progress in achieving its long-term goals. In addition, they commit to renew every five years their national action plans which list their goals and national measures to limit greenhouse gas emissions and strengthen their resilience to the impacts of climate change.¹

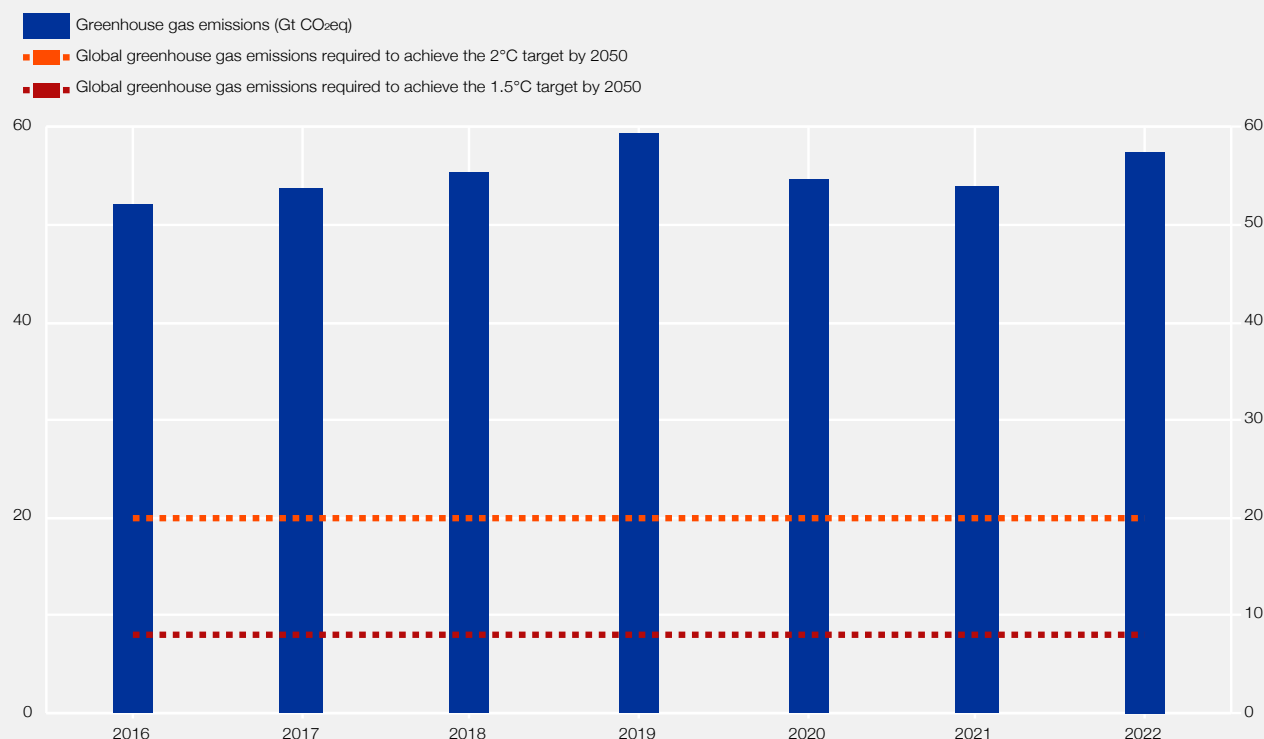
Global Stocktake

The latest UN Climate Change Conference (COP28) that took place in Dubai, United Arab Emirates, in December 2023, discussed the first Global Stocktake towards the achievement of the Agreement's goals. It was found that, on the basis of the measures already adopted, there is a significant deviation from the goal to contain the global average temperature increase. In particular, there is a significant gap between the estimated greenhouse gas emissions and those that would reduce the temperature increase by 1.5°C. This "emission gap"² is equal to 19 gigatonnes (i.e. billion tonnes) of carbon dioxide equivalent (Gt CO₂eq).³ Chart A shows the levels of global greenhouse gas emissions from 2016 to 2022 and the corresponding levels required by 2050 in order to achieve the goal of holding the temperature increase below 2°C and 1.5°C respectively.

The gap is also confirmed by the temperatures throughout 2023, which goes down in history as the warmest calendar year on record. 2023 marks the first time on record that every day within a year has exceeded 1°C above

Chart A Global greenhouse gas emissions (2016-2022)

(in gigatonnes of CO₂ equivalent)



Source: United Nations, Emissions Gap Report for the years 2017 to 2023.

1 [United Nations, All About the NDCs.](#)

2 The emission gap is defined as the difference between the estimated global greenhouse gas emissions resulting from the full implementation of the most recent Nationally Determined Contributions (NDCs) and the levels in line with the transition pathways to meet the long-term goals of holding the temperature increase under the Paris Agreement.

3 United Nations (2023), [Emissions Gap Report 2023.](#)

Chart B Daily global average temperature increase above pre-industrial levels (1850-1900) in 2023



the pre-industrial levels. Moreover, close to 50% of days were more than 1.5°C warmer than the pre-industrial levels and two days in November were, for the first time, more than 2°C warmer⁴ (see Chart B).

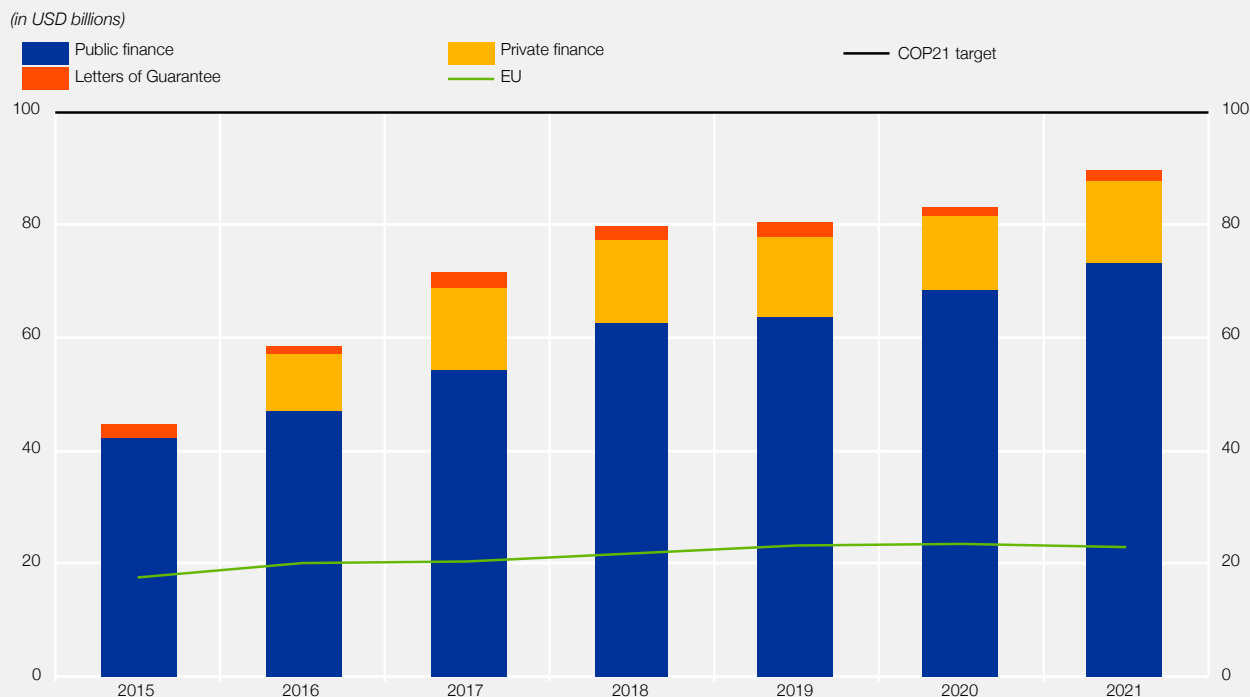
The analysis from the Global Stocktake notes that, in order to align with the goals of the Agreement towards a zero-emission economy by 2050 and limit the global average temperature increase, transformations are needed across all sectors of economic activity, as well as national partnerships and more ambitious measures to reduce greenhouse gas emissions and adapt to climate change. Specifically, greenhouse gas emissions need to be reduced by 43% by 2030, 60% by 2035 and 84% by 2050, compared with the 2019 levels, in order to limit global warming to 1.5°C.⁵

With regard to adaptation to climate change, the Global Stocktake analysis highlights, among other things, the need for more decisive and effective adaptation strategies, such as the involvement of local communities, which are experiencing the consequences of climate change, in decision-making, as well as enhanced transparency on progress in adaptation.

Furthermore, it notes that financial flows should be scaled up in order to achieve the goals of the Agreement, as the issue of funding constitutes an important part of it. Among other things, while the Agreement set a target of USD 100 billion per annum for developed countries to contribute to international climate finance by 2025, there was a funding gap of USD 192 billion from 2015 to 2022 according to OECD data. There is a general need to accelerate climate finance from all sources, private, public, domestic or international, with developed countries providing financial assistance and support to developing countries. It is worth noting that the European Union is

⁴ Copernicus, [Global climate highlights 2023](#).

⁵ United Nations (2023), [Technical dialogue of the first global stocktake](#).

Chart C Finance provided to developing countries to fight climate change for the period 2015-2022 per finance type

Sources: OECD and European Commission.

Note: The Paris Agreement set a target of USD 100 billion per annum for developed countries to contribute to international climate finance by 2025.

one of the largest providers of climate finance worldwide. In 2022 it contributed EUR 28.5 billion to climate actions finance from public sources^{6,7} (see Chart C).

As far as the European Union is concerned, the Global Stocktake points are confirmed and reinforced by the recent report of the European Scientific Advisory Board on Climate Change, which proposes both immediate and medium-term measures to achieve the EU's "climate neutrality" objectives by 2030 and 2050.⁸ Moreover, a report by the European Commission, published on 6.2.2024,⁹ estimated that, in order to achieve a 90% reduction in emissions by 2040 and full climate neutrality in the EU economy by 2050, investments of EUR 1.53 trillion per annum will be required over the period 2031-2050 (EUR 660 billion per annum net of the investment in transport and purchase of new vehicles cost, estimated at EUR 870 billion per annum).

Decisions of the 28th UN Climate Change Conference

The undeniable culmination of the latest UN Climate Change Conference (COP28) is the final consensual text, which, among other things, speaks of moving away from fossil fuels in energy systems, tripling renewable energy capacity by 2030 and expediting the energy transition in a just, orderly and equitable manner, accelerating action over the remainder of this critical decade in order to achieve carbon neutrality by 2050.^{10,11,12}

6 OECD (2023), [Climate Finance Provided and Mobilised by Developed Countries in 2013-2021](#).

7 Council of the EU, [Infographic – Europe's contribution to climate finance](#).

8 European Scientific Advisory Board on Climate Change, [Towards EU climate neutrality: progress, policy gaps and opportunities – Assessment Report 2024](#).

9 [European Commission Communication: Securing our future: Europe's 2040 climate target and path to climate neutrality by 2050 building a sustainable, just and prosperous society](#).

10 McKinsey, ["Outcomes from COP28: What next to accelerate climate action?"](#), 21.12.2023.

11 International Energy Agency, ["IEA assessment of the evolving pledges at COP28"](#), 10.12.2023.

12 United Nations, ["COP28 Agreement Signals 'Beginning of the End' of the Fossil Fuel Era"](#), 13.12.2023.

Important decisions were also taken on critical issues. For the first time, methane emissions were specifically mentioned. This gas is considered to be a super pollutant. The EU and the US committed to take concrete measures to contain them.

It was also recognised that it is now of strategic importance to speed up implementation or research (as appropriate) for critical technologies classified as “green”, such as renewables, nuclear energy (for which serious objections have been raised), carbon sequestration technologies and nuclear fusion (the actual use of which on a massive scale is estimated to require decades). To this end, it was decided to triple electricity production from renewable energy sources (RES), double energy efficiency measures, introduce new standards to liberalise the hydrogen market, triple electricity production from countries with nuclear power plants and reduce to the greatest degree possible Scope 1 and Scope 2 emissions¹³ from all countries.

The energy, industrial and transport sectors, which are regarded as high greenhouse gas emissions-generating sectors, have decided to cooperate, invest in research and development and move faster towards a zero-emission economy. For the first time, representatives of 130 countries signed the declaration on sustainable agriculture, resilient food systems, and climate action at COP28, which sets specific targets by 2025.

It is worth noting that an agreement has been reached on the application of the rules of the Loss and Damage Fund. The members’ financial pledge so far amounts to USD 726 million and it has been agreed that the World Bank will be responsible for its initial management.

It was also decided that the targets and structure of the adaptation measures of the signatories to the Agreement would be aligned with a framework for a Global Goal on Adaptation (GGA). All of them are now required by 2030 to adopt concrete measures and actions for their respective national adaptation policies.

COP28 was concluded leaving several open issues. In particular, there was no clear reference to the complete and definitive elimination of fossil fuels, there was no agreement on a common practice to finance poorer states towards climate transition and to reduce the funding gap from developed countries to developing countries, while the latter’s funding needs in this respect are more urgent than ever. Finally, there was no reference to the establishment rules of the global emissions trading system, nor to general or specific funding issues.

At the same time, however, the foundations for future action plans were laid. All parties involved will have to submit their revised targets for limiting greenhouse gas emissions in the first four months of 2025, so that the targets are compatible with the aim of limiting the global average temperature increase to 1.5°C.

At the next United Nations Climate Change Conference (COP29), to be held in Azerbaijan, all governments involved will have to set specific climate finance goals and then at the 30th Conference (COP30) they must come prepared with new and concrete nationally determined contributions that are economy-wide. Finally, the total greenhouse gas emissions from the production process in each country should be fully in line with the global goal of limiting temperature increase to 1.5°C.

Conclusions

The first stocktake towards the achievement of the Paris Agreement goals demonstrates the need to accelerate actions to tackle the climate crisis. It is stressed that the issue of climate change should be addressed jointly by all institutions and national economies as a problem which requires a holistic approach. Cooperation and solidarity between nations, but also local societies, are now necessary to achieve the goals relating to the transition to zero-emission energy systems, climate finance and adaptation efforts. The climate crisis must mobilise us towards a unified and ambitious action by all parties involved, potentially leading us to a collective climate-neutral future, in terms of emissions.

¹³ “Scope 1 emissions” are defined as direct greenhouse gas emissions from sources owned or controlled by the financial entity concerned. “Scope 2 emissions” are defined as indirect emissions resulting from the consumption of electricity purchased by the financial entity concerned (see <https://ghgprotocol.org/>).

Box 20

THE DEGRADATION OF ECOSYSTEMS AND BIODIVERSITY LOSS POSE RISKS TO THE ECONOMY AND THE FINANCIAL SYSTEM

Biodiversity, an important element of ecosystem functions, contributes inter alia to ensuring adequate air quality for people to breathe, to the provision of food (and food security) and to pharmaceuticals, as well as to climate regulation through carbon capture and storage.^{1,2} In addition, more than 50% of global GDP depends on nature and the services it provides, with construction, agriculture, as well as the food and beverages sector heavily dependent on it.³

Nature is in a crisis situation, which threatens human existence and well-being

Human activity is exerting increasing pressure on nature, reducing its ability to support the planet by providing sufficient resources and services. Indicatively, out of the nine planetary boundaries which constitute the safe operating space for humanity, it is estimated that six have already been transgressed, a fact that increases the risk of abrupt or irreversible environmental changes of a significant scale.⁴ Studies also show that over the last four decades, almost three quarters of the Earth's surface have been altered, while the biodiversity loss rate has been constantly increasing – perhaps it is the highest ever, with a significant number of living things at risk of extinction and/or having already been extinct.⁵

The main reasons for the loss of ecosystem services⁶ are: (a) changes in the use of land and water; (b) over-exploitation of natural resources and ecosystems; (c) increase in greenhouse gases (leading to climate change); (d) pollution; and (e) invasive alien species.⁷ Climate change is also found to be interrelated with nature; it affects and is affected by nature. For example, extreme weather events (such as a flood) destroy natural resources, while the reduction of nature's ability to regulate the climate, due to the destruction of the natural environment, is exacerbating climate change.

The risk of biodiversity loss and ecosystem collapse is assessed as the world's fastest growing risk for the next decade, according to the World Economic Forum, with significant social and economic consequences. Indicatively, the loss and degradation of land and biodiversity have the effect of reducing crop and catch yield, as well as increasing economic loss from flooding and other disasters.⁸

The loss of ecosystem services and resources creates financial risks

Nature-related and ecosystem financial risks are divided into physical and transition risks, as is the case with climate-related financial risks. In particular, physical risks may arise from acute and chronic events, while transition risks may be caused by changes in policies, technologies and consumer and investor preferences.⁹

1 See [The Economics of Biodiversity: The Dasgupta Review \(2021\)](#).

2 Biodiversity is defined as the variety of ecosystems (natural capital), species and genes in the world or in a particular habitat (see European Environment Agency, "[Biodiversity – Ecosystems](#)").

3 World Economic Forum (2020), *Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy*.

4 The planetary boundaries are: climate change, biosphere integrity, land system change, freshwater use, biogeochemical flows (nitrogen cycle, phosphorus cycle), chemical pollution, ocean acidification, atmospheric aerosol loading and stratospheric ozone depletion. The first six of these boundaries have already been transgressed, while ocean acidification is close to the safe operating space threshold for humanity. See Richardson et al. (2023), "Earth beyond six of nine planetary boundaries", *Science Advances*, 9(37).

5 IPBES (2019), *Global Assessment Report on Biodiversity and Ecosystem Services*.

6 Ecosystem services can be divided into provisioning, regulating and cultural services (see European Environment Agency, [What are ecosystem services?](#)).

7 See IPBES (2019), op. cit. and IPBES (2023), *Thematic Assessment Report on Invasive Alien Species and their Control*.

8 World Economic Forum (2023), *The Global Risks Report 2023*.

9 ECB/ESRB (2023), [Towards macroprudential frameworks for managing climate risk – December 2023](#).

The economy and the financial system can be affected by the loss of ecosystems and their services directly and indirectly. These risks are therefore direct and indirect. In particular, direct risks may arise from the direct dependence of economic activities, such as agriculture, mining and infrastructure, on the ecosystem or from its impact on them. Indirect risks can be created through the value chain and thus affect economic activities that are not directly related to nature, such as services. In addition, economic activities may also affect these ecosystems and the services they provide, i.e. there is a two-way relationship between economic activities and ecosystems. Recent examples of such risks in Greece, with nature and biodiversity interacting with the economy, include the wildfires in Rhodes and the Dadia Forest National Park, Thrace, in the summer of 2023, the floods in Thessaly in September 2023 and –two years earlier– the wildfires in Euboea in August 2021, while a prominent international example were the record-breaking wildfires in Canada’s forests in the summer of 2023, which affected a vast amount of land with their pollutants.

These risks affect individuals, businesses, industries, local and national economies, i.e. they have micro and macroeconomic effects, potentially affecting the economy, financial institutions and the financial system. In a joint study, the European Central Bank and the European Systemic Risk Board estimate that in the euro area around 75% of bank loans to non-financial corporations and more than 30% of insurers’ investments in corporate bonds and equity are directed towards firms that have a high dependency on at least one ecosystem service.¹⁰ These services mainly include: surface and ground water, mass stabilisation and erosion control, as well as flood and storm protection. The relevant sensitivity analysis exercise found that the credit risk of the bank credit portfolios examined increases in biodiversity loss scenarios. Moreover, the same study states that the economic activities of euro area non-financial corporations have an impact on nature comparable to the loss of 582 million hectares of “pristine” nature.

Central banks focus on nature-related and ecosystem risks

Nature-related and ecosystem risks have not been sufficiently analysed so far, due to their peculiar characteristics, such as the significant degree of uncertainty surrounding their impact, non-linearity, tipping points¹¹ and complexity. However, as the economy is inextricably linked with nature and while the primary responsibility for addressing these challenges lies with governments, central banks should also take into account nature-related risks in fulfilling their mandate.¹² Significant analyses on these issues, such as those of the Network for Greening the Financial System (NGFS) and the European Central Bank (ECB) (see Chapter X, Section 1 of the Bank of Greece’s *Annual Report 2023*), help to properly assess and address these risks with a coherent and comprehensive approach, together with climate-related issues. Indicatively, in a recent communication on the orientation of its actions for 2024-2025, the ECB mentions nature-related risks as one of the three focus areas.¹³ Further actions in this direction, such as the production of relevant research, the understanding of the transmission channels of these risks and the quantification of the impact, will contribute to a more complete and sound management of nature-related risks.

¹⁰ Op. cit.

¹¹ Tipping points refer to critical thresholds in a system that, when exceeded, can lead to a significant change in the state of the system, often with an understanding that the change is irreversible (see IPCC (2019), *Special Report – Global Warming of 1.5 °C*, Chapter 3).

¹² See Frank Elderson, “[The economy and banks need nature to survive](#)”, *The ECB Blog*, 2023.

¹³ “[ECB steps up climate work with focus on green transition, climate and nature-related risks](#)”, press release, 30.1.2024.